PEEC
Pocono Environmental
Education Center

Est. 1972

Scenic Gorge
TRAIL GUIDE

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WWW.PEEC.ORG

INTRODUCTION

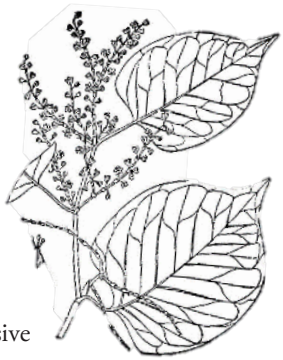
Welcome to the **Scenic Gorge** trail at the Pocono Environmental Education Center (PEEC). This is a 1.5 mile trail of moderate difficulty and is blazed with red paint. The trail will take you through a variety of forest types and lead you along Spackman's Creek as it meanders through our hemlock forest. As you travel along our trail, you will explore a number of topics relevant to forest study. As with all of our trails, there is a chance of coming in contact with poison ivy and ticks.

Poison ivy *(Toxicodendron radicans)* can grow in a variety of ways, but in our forests it will typically be found as either a small erect plant or a vine with numerous hairs protruding from it. All parts of the plant contain the poisonous oils. The easiest way to identify the plant is by observing its leaves. The leaves tend to be grouped in threes and are a glossy dark green. Poison ivy is an edge specialist and is commonly found near our trails. If you come in contact with the oils, you should wash the area off with cool water.

The **black legged tick** *(Ixodes scapularis)*, also known as the deer tick, can carry **Lyme disease**. The life cycle of the tick generally takes about two years to complete, during which it will go through four life stages: egg, six-legged larva, eight-legged nymph, and adult. The ticks must feed on a new host at each stage of their life. The deer tick rests on the edges of grasses and shrubs with its front legs outstretched until it can grab onto to a host. If you remove the tick within 24 hours, you can greatly reduce your chance of contracting Lyme disease. Make sure to thoroughly check your body after you leave an area with ticks in it. Pictures and information on ticks and Lyme disease can be found in the main building.

1 INVASIVE SPECIES

An **invasive species** is a species that does not occur naturally and whose introduction is likely to cause economic or environmental harm. At one point it had been common to introduce non-natives, especially plants, into our ecosystems. Over time, people began to witness the devastating impacts invasive species could have on an environment that was ill equipped to handle them. Plants once brought over as ornamentals or for environmental reasons began to spread. Now invasive species out compete native plants, change soil compositions, and can even be noxious to wildlife and humans alike.



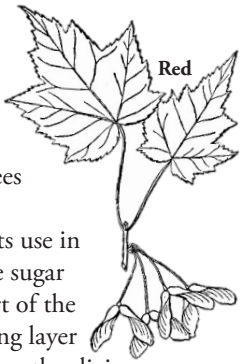
Japanese Knotweed
(Polygonum cuspidatum)

2 ALLELOPATHY

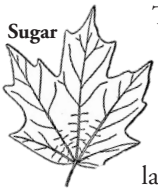
This tree is a **black walnut** *(Juglans nigra)*. Black walnut is one of the rarest and most coveted hardwoods. Its fine grained wood is prized for the productions of furniture and gun stocks and its nuts are used primarily for baking, unless the squirrels get to them first. Black walnut is extremely sensitive to soil and

climatic conditions and grows best in deep, pH neutral, and well drained soils. Black walnut is intolerant to shade and often loses out to more competitive sun-hungry trees. The black walnut tree, however, has an interesting survival tactic to help it prevail over the other trees, which it uses without discrimination. **Allelopathy** is the chemical inhibition of one living thing by another - essentially chemical warfare. Black walnut trees produce a chemical called juglone, which affects nearby plants by disrupting the respiratory systems needed to carry out photosynthesis. While some plants may be resistant to juglone, most don't survive. The effects of juglone on animals, plants, and people are very similar to that of cyanide.

3 MAPLE MAYHEM



The **red maple** *(Acer rubrum)* is one of the most common trees in North America. This is due to its ability to thrive in a wide range of climatic conditions and soil types. Red maples act as **pioneer species**, meaning that they are often one of the first trees to inhabit a cleared area during succession.

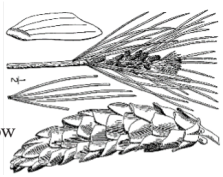


The **sugar maple** *(Acer saccharum)* is best known for its use in the production of maple syrup. Its sap has twice the sugar content of other trees. Sap is extracted from the part of the tree known as the **sapwood**. The sapwood is a living layer that transports water. Food is transported through another living layer known as the **inner bark**. Between these two layers is the **cambium**, in which the growth takes place. The central most part of the tree, known as the **heartwood**, is a dead layer that provides stability. The outermost layer is another dead layer, known as the **bark**, which protects the tree from the outside world.

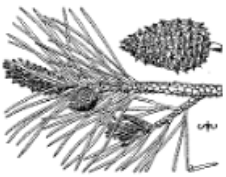
4 PINE IDENTIFICATION

This area is a great place to explore a few of the pine species we have on our trails. Pine trees can be distinguished from other conifers in that their needles grow together in bundles called **fascicles**. You also may notice that many of the lower branches of our pines are dead or missing. Plants are able to use the energy of the sun to change carbon dioxide and water into sugar and oxygen in a process known as **photosynthesis**. Most of the light is absorbed near the top of the tree. If the lower branches do not receive enough light to support them, then the tree allows them to die off.

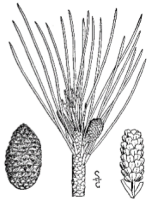
White Pine
(Pinus strobus)
Needles: 5 per bundle
Cones: 4-8"; narrow and cylindrical



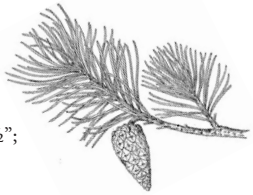
Pitch Pine
(Pinus rigida)
Needles: 3 per bundle
Cones: 1½ - 3"; recurved prickles



Red Pine
(Pinus resinosa)
Needles: : 2 per bundle; stiff
Cones: 2”



Scots Pine
(Pinus sylvestris)
Needles: 2 per bundle; twisted
Cones: 1½ - 2½”; nearly spherical



5 EUROPEAN LARCH

Phenology refers to the seasonal changes that occur in plants and animals year after year. As winter nears, plants need to prepare for freezing temperatures, drought-like conditions, and low amounts of sunlight. **Deciduous** plants have leaves which usually require more nutrients and, therefore, fall off. **Evergreen** plants, on the other hand, have leaves which are usually more tolerant to harsh weather conditions and, therefore, can be retained.

Coniferous trees produce cones and tend to have leaves that are reduced and needle-like. As a rule, conifers tend to be evergreen. The tree before you is a type of conifer known as a **European larch** *(Larix decidua)*. This tree, however, loses its needles during winter, making it one of the only deciduous and coniferous trees.

6 SOIL

Soil is a mixture of minerals, water, air, and organic material. The soil of an area determines the plant life that grows there, which affects what animals can live there. By identifying the plants in an area, we can then make an accurate guess as to the soil composition.

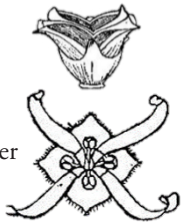
The major forest type in our region and the one you are currently standing in is classified as a **mixed oak forest**. The dominant trees in this forest type include black oak, red oak, white oak, and white pine. While each of the oaks can be found in abundance, they each have different soil requirements and will be found in varying densities depending on where you are.

Black Oak
(Quercus velutina)
Soil: Dry, Rocky Uplands

Red Oak
(Quercus rubra)
Soil: Sandy, Gravel, Well-Drained

White Oak
(Quercus alba)
Soil: Rich, Moist Bottomlands

7 WITCH HAZEL



Flowering plants are a large and diverse group, making up over 80% of the species in the Plant Kingdom. The flower is the reproductive part of the plant and is composed of four kinds of specialized leaves. Centrally located are the male and female parts of the plant, known as the **stamen** and **carpel** respectively. The **petals** surround the flower and are generally used to attract pollinators. The **sepals** protect the flower during the early stages of development.

Most of our plants produce flowers in the spring or summer; however, **witch hazel** *(Hamamelis virginiana)* has adapted to blooming during the fall. This reduces competition and ensures that the remaining insects will need to seek out the witch hazel's flowers.

8 A LOST FOREST CHAMPION

It's hard to believe it today, but the **American chestnut** *(Castanea dentata)* once dominated our eastern forests. It is estimated that one out of four of the hardwood trees (two out of three in Pennsylvania) were American chestnuts. By the first half of the 20th century, however, four billion of them had been killed off. This began in the 19th century when our chestnuts were attacked by a fungus *(Phytophthora cinnamomi)*, which caused individuals to develop root rot. This fungus was then followed by the **chestnut blight** *(Cryphonectria parasitica)*, which causes cankers and ultimately death in the infected trees. Currently, scientists have been researching ways of reintroducing individuals that have been hybridized with a blight resistant Asian species.

9 LAYERS OF A FOREST

In addition to studying forest type, is it important that we also study the various layers in the forest. The **canopy** is the uppermost layer of the forest and where the majority of sunlight is absorbed. The understory is below the canopy and consists of more shade tolerant trees. Below the **understory**, we have the **shrub** layer; this consists of many of our fruiting plants. Finally, we have the lowest level, the **forest floor**; this contains all the soil and decomposing plant and animal matter.

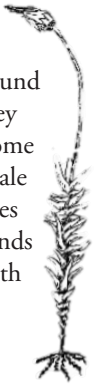
Canopy	White Pine, Black Oak, Red Oak, White Oak, American Beech, White Ash, Red Maple, Sugar Maple
Understory	American Hornbeam, Hop Hornbeam, Serviceberry, Dogwood, Young Trees
Shrub	Mapleleaf Viburnum, Rhododendron, Spicebush, Witch Hazel
Forest Floor	Partridge Berry, Striped Prince's Pine, Eastern Teaberry

⑩ EASTERN RED CEDAR

The **Eastern red cedar** *(Juniperus virginiana)* is an interesting member of the coniferous plant group. The 'berries' found on the red cedar are actually cones that have fleshy scales. Unlike other conifers, which have needles, the leaves of the red cedar are closely compressed to the branchlets, giving them a more scale-like appearance. A second type of leaf, awl-like in appearance, can be found on younger individuals. The eastern red cedar is not a true cedar, but a juniper. True cedars are natives to the Mediterranean.

The eastern red cedar prefers soils that tend to be rocky and dry. You should notice that the canopy is not as dense, which is allowing more sunlight through. Though young individuals can tolerate some shade, adult red cedars require full sun. As you continue your hike, you will not see as many red cedars.

⑪ HAIRY-CAP MOSS



The small plants, apparent in the clearing, belong to a much over-looked member of the Plant Kingdom: the mosses. These mosses, which can be found easily in this region, are known as **Hairy-cap mosses** *(Polytrichum sp.)*. They have received this name because the stalk-like structures that grow out of some of the plants have hairs at the end of them. While other plants will have male and female parts on the same plant, hairy-cap mosses have males and females in separate colonies. The females produce a stalk-like structure, which extends out of the plant and contains the spores. Spores should not be confused with seeds. **Spores** are reproductive units that divide asexually into a new plant, whereas a **seed** is an encased plant embryo. The males will have flower-like splash-cups on their tops, which contain the sperm-producing organs. The sperm cells leave the male plant and must swim through a film of water to the female plant.

⑫ IRONWOOD AND MUSCLEWOOD

Two trees in our forests share the name 'ironwood'. They are known as the **American hornbeam** *(Carpinus caroliniana)* and the **hop hornbeam** *(Ostrya virginiana)*. Both of these trees belong to the birch family and have similarly serrated leaves. These trees also have flowers arranged in cylindrical clusters, known as **catkins**, which are generally found in tree species that are pollinated by the wind.

There are a number of ways to discern between the two species of trees. The American hornbeam prefers the drier, rockier soils common of the upland regions, whereas the hop hornbeam prefers the wetter soils of the bottomlands. Perhaps the easiest way to identify the two species is to examine their bark. The hop hornbeam has a brownish, scaly bark. The American hornbeam, in contrast, has bark that is bluish-gray with smoothed vertical ridges. This gives the bark the appearance of muscles and, thus, is sometimes referred to as 'musclewood'. The tree that you see here is the American hornbeam.

13 SUCCESSION

When we walk through our forests, it's hard to realize that they are in a constant state of change, but if we look closely we can find evidence of this change. The rock wall you see in front of you is a remnant of the farmlands that once covered this area. The soil in this region is very rocky. As farmers plowed their fields, they pulled up these rocks which they then used to build the walls you can find spread out through our forests. Those days, however, are gone and the forest has reclaimed this land in a process we call succession. Those farm fields turned to grassland and, slowly, trees and shrubs grew, forming the forest you see today.

14 SHAGBARK HICKORY

This tree is a **shagbark hickory** *(Carya ovata)*. The shagbark hickory gets its name from its loose-plated bark, which appears as though it's peeling off the tree. Shagbark hickory trees grow best in humid climates, but have been able to adapt to a wide variety of climatic conditions and can be found extensively throughout the central/eastern United States. The wood from this tree is a very popular fuel wood since it burns evenly and gives food a hickory-smoked flavor. It is also a very strong wood and is used for flooring and tool handles. Shagbark hickory sap can be used to make syrup.

15 ECOTONE

If you stand facing this number block, you will see that to your right there is a mixed oak deciduous forest and to your left there is a coniferous hemlock forest. Between these you can observe a dividing line or transitional area between these two forests called an **ecotone**. Ecotones are important because they can provide a habitat for both plants and animals that require elements of two different biomes. The soil here is not quite as acidic as the tannin rich hemlock forest soil and is not as neutral as the soil of the mixed oak forest. It, therefore, appeals to plants that have special soil requirements that fall between the soil types. Animals in this area benefit from food produced in the mixed oak forest such as acorns and berries, while also benefiting from the shade and protective canopy cover of the hemlock ravine.

16 HEMLOCK FORESTS

As you walk through the hemlock ravine, you should notice that fewer plants reside on the forest floor than in the mixed-oak forest. This is due to shade and the acidic tannins contained within the needles, which are released when the needles begin to decompose. This makes the soil slightly acidic, which prevents many other plants from growing, thereby reducing competition. Hemlock saplings are also well adapted to growing in the low light environment caused by the dense canopy. Mosses are another plant that can be found thriving in our hemlock forest. Unlike other plants, mosses do not have the **vascular tissues** needed to transports food and water around their bodies. Nutrients in mosses must move from regions of high concentration to low concentrations in a

process known as **diffusion**. Water is transported by a specific type of diffusion known as **osmosis**. Mosses also require external water to act as a passageway to transport sex cells. The reduced light and moisture caused by the nearby stream creates an ideal habitat for many of our moss species.

17 EVERGREEN WOOD FERN

The plants scattered about your feet are known as **evergreen wood ferns** *(Dryopteris intermedia)*. The large leaves appearing out of the ground are called **fronds**. You might be wondering where the rest of the plant is. Ferns have an underground stem, known as a **rhizome**. The roots then extend down even lower in the ground. This makes ferns very difficult to pull up alive. Turn over one of the fronds and examine the underside. The small structures you should see are called **sori** and within them are numerous **spores**.

18 SWEET BIRCH

This is a **sweet birch** *(Betula lenta)*, commonly referred to as a black birch or cherry birch. You may notice that these deciduous trees seem a little out of place amongst a forest of hemlocks. These trees are tolerant of the acidic soils that are characteristic of hemlock and other coniferous forests. Black birches require more sunlight to grow than the hemlocks; therefore, you'll notice them in the more well-lit areas of this forest.

Black birch used to be one of the few sources for oil of wintergreen, which is now chemically synthesized. It also has been used extensively for the production of furniture due to its darker color once dried, which resembles mahogany. The sap of the black birch was also used to make an alcoholic drink called birch beer and is now used to make a soft drink bearing the same name.

19 WOOLLY INVADERS

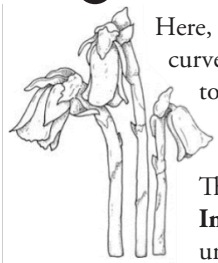
This tree, known as the **Eastern hemlock** *(Tsuga canadensis)*, is the state tree of Pennsylvania. Though the conservation status of this tree is considered to be secure, there is a war being waged within the forest you stand in. A small aphid-like insect known as the **hemlock woolly adelgid** *(Adelges tsugae)*, native to Asia, has infected the trees within this area. These voracious insects feed on the bases of the hemlock needles, causing them to fall off and preventing any new growth. The hemlock woolly adelgid were first reported in Richmond, Virginia in 1951 and, by 2005, had infected 16 states – the most severely affected being Pennsylvania, Virginia, New Jersey, and Connecticut. Mortality and decline of the trees usually occurs within four to ten years after infestation.

As you walk through this forest, you may notice white tags pinned to the trees. These are hemlocks that have been treated with pesticide in order to help aid the hemlocks in their resistance to the woolly adelgid.

20 HEALTHY FORESTS MAKE FOR HEALTHY STREAMS

Water is considered by many to be the world's most precious resource. Only about 2.5% of the water on Earth is freshwater, and, of that, only 1% is accessible to humans. Many types of pollutants affect our freshwater resources. Some of the most common types of pollution include sediment, bacteria, and chemicals, such as nitrates and phosphates. Our forests are important because they help to keep our water clean by absorbing pollutants before they reach the water, and the roots of plants help to keep the soil in place. The area around streams is known as the **riparian zone**, and it is exceptionally important as a buffer zone. The Hemlock trees in this area function as that buffer zone, trapping soil and excess nutrients/pollutants from entering the stream.

21 GHOST PLANTS



Here, and in other parts of our forest, you may encounter small, whitish, curved stalks extending out of the ground. At first, they may appear to be a type of fungus, but upon closer inspection you can see that the stalk terminates at a flower. The plant you are looking at is one of the few non-photosynthetic plants we have in our region. These plants lack the green chlorophyll present in most plants. **Indian pipe** *(Monotropa uniflora)* survives as a parasite on underground fungi, which in turn are sapping nutrients from the roots of trees. The plants are most readily seen during the summer, but the dried blackened stalks can be found at almost any time of the year.

22 DECOMPOSITION

Decay is an important process in our natural environment. Through decomposition, nutrients that were once locked away in living organisms are cycled back into the soil. Organisms that feed on decaying matter are called **saprophytes**. Bacteria are the primary decomposers of animal tissue, while fungi are the primary decomposers of plant material.

Another equally important role incorporated with some of our fungi is to live in a relationship with plants known as **mycorrhizae**. This close association is utilized by about 90% of our land plants. The plant provides the fungus with food, while the fungus helps the plant to pull in water and essential nutrients from the soil. Plants connected to these fungal networks are then able to share nutrients with other plants and spread toxins to competitors.

23 AMERICAN BEECH

Marcescence is the retention of dead plant organs that are normally shed, such as the leaves of deciduous plants. The tree you see in front of you is a prime example. The **American Beech** *(Fagus grandifolia)*, which is easily identified by its smooth gray bark, can also be identified during the winter months because the dead leaves remain on the branches.

Marcescent leaves are believed to be a juvenile characteristic, but they can also be found on the lower branches of mature trees. There are a number of reasons why a tree may retain its dead leaves. One possible reason is the dead leaves help to deter animals from browsing on the buds. Another possible reason is to better control the release of nutrients into the ground. As leaves fall to the ground and begin to decompose, they release nutrients into the soil; having leaves fall off during the spring assures that nutrients will be in the soil during the buds early stages of growth.

24 CHESTNUT OAK

The tree you see here is a **chestnut oak** *(Quercus prinus)*. Chestnut oaks are one of our more easily identifiable oak species. Right away you should notice that the bark contains deep furrows, giving this tree a more rough appearance than other trees in our area. Besides the bark, the chestnut oak has very distinct leaves when compared with other oaks. The leaves bear a striking resemblance to those of the American chestnut, which helped name this species.

Perhaps a more fitting name for this oak would be the rock oak, due to its preferred habitat being dry, rocky ridges with shallow soils. Most notably an upland species, individuals that grow lower on slopes, in richer soils, will grow straighter and reach taller heights.

It is not uncommon to find individuals that appear to have multiple stems growing from the ground. When the chestnut oak is damaged, it produces a form of asexual growth, known as a **sucker**. This appears off the main stem or root system, sucking nutrients from the parent system.

25 GROUND PLANTS

Many inconspicuous plants layer our forest floor. While we may forget many of them are around, they are nonetheless important to our forests. Some of the more common plants are listed below.

Eastern Teaberry
(Gaultheria procumbens)

Partridge Berry
(Mitchella repens)

Striped Prince's Pine
(Chimaphila maculata)

26 LICHEN

You should notice that the bark of many of the trees in this area is covered in a green, flaky material. This material is actually a living thing, known as lichen. **Lichen** consists of two organisms (algae & fungus) living in a close relationship we call **symbiosis**. The algae has **chlorophyll** inside it, which helps it capture the energy of the sun. Both the algae and the fungus benefit from the food produced. The fungus, in return, provides protection from adverse conditions, such as drought. Since both organisms benefit, this particular symbiotic relationship is called **mutualism**.

This is the last marker on the trail. Head up the road to the right, then follow the main road to the right back to the main building. We hope you enjoyed the trail.

Where Learning Comes Naturally

The Pocono Environmental Education Center (PEEC) is the perfect place for learning, exploring, getting away, and connecting with nature and others. With six hiking trails, weekend educational programs, and summer camp, PEEC is a great place for nature lovers, families, friends, photographers, youth and adult groups, scouts, students, and teachers. A private 501(c)(3) non-profit organization, PEEC is the educational partner of the National park service in the Delaware Water Gap National Recreation Area. PEEC's mission is to advance environmental education, sustainable living, and appreciation for nature through hands-on experience in a national park.

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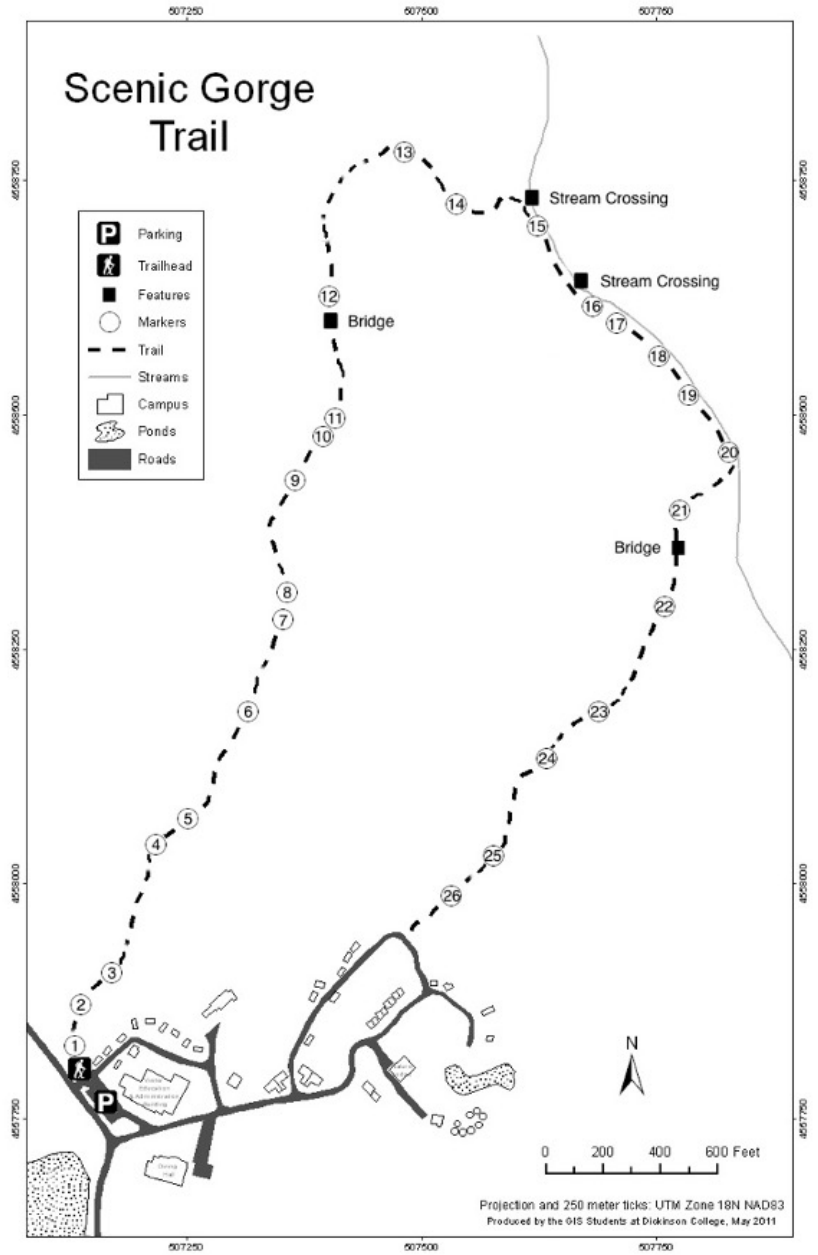
Trail Map

If you no longer have a need for this trail guide, please return it to the front desk so that it may be used again.



Images courtesy of the USDA